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THE GENESIS OF NEUROSIS

AN OBJECTIVE ACCOUNT*

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Definition. It is in the psychoanalytic tradition to define neurosis in terms of some causal hypothesis, such as 'an insufficiency of the normal control apparatus' (Fenichel[3]) or 'a clinging to infantile pleasurable longings and phantasies' (Jones[7]). Even the writers who employ the above definitions do not in practice recognize neuroses in the clinic by the criteria of their definitions, but by certain observable characteristics of the individual cases. The following definition is presented in the belief that it abstracts what is common to all the heterogeneous forms in which neuroses are found.

Neurotic behaviour is unadaptive learned behaviour that despite repeated evocations fails to become extinguished[2].

The word 'learned' is used in this definition to exclude behaviour that has its origins in the physiological development of the organism or in organic lesions. That neurotic behaviour is indeed learned will be shown in the paragraphs that follow.

'Adaptive' behaviour has the *effect* of leading directly or indirectly to the reduction of the organism's needs or to the prevention of injury or fatigue. Behaviour that does not have such effects is termed 'unadaptive'. In most circumstances *unadaptive* behaviour has effects that automatically result in its own extinction. Suppose, e.g. that a child has learned when hungry to open a certain cupboard because previously he has found cookies there. If on any occasion there are no cookies in the cupboard, to open it will be objectively unadaptive; and if the cupboard is constantly found empty, cupboard-opening will eventually be extinguished. The automatic mechanism by which, in association with fatigue, extinction is brought about has been brilliantly worked out in what is now called the Mowrer-Miller hypothesis (Hull[6]). Sometimes unadaptive behaviour, though repeatedly evoked, fails to be extinguished, and *it is then called neurotic.* What determines this failure of extinction will emerge from the following.

SUMMARY STATEMENT ABOUT LEARNING

The argument of this paper has as its background an objective interpretation of the learning process based on the work of Hull[6] which can only be outlined here in the briefest manner.

If an effector response is made to occur in temporal contiguity with a given sensory stimulus, and it is subsequently found that the stimulus can evoke the response although it could not have done so before, learning may be said to have occurred. If the stimulus could have evoked the response before, and subsequently evokes it more strongly, then, too, learning may be said to have occurred. It has been shown elsewhere,[20] largely on the basis of a striking experiment by Culler,[1] that learning is subserved by the development of conductivity between neurones in anatomical apposition. Numerous experiments have shown that in a given learning situation there is a quantitative relationship between the degree of drive reduction and the amount of learning that occurs. In as far as learning has a neural substrate, the relevant correlate of drive reduction that enters into the process is assumed to be reduction of central neural excitation.

* Acknowledgement is made to Dr. L. J. Reyna for help in the preparation of this article. The experiments referred to were aided by a grant from the Council for Scientific and Industrial Research.

2. For a more complete discussion of this definition see reference 19.

EXPERIMENTAL NEUROSIS

That neurotic behaviour is a type of learned behaviour seems clear from the nature of the methods by which neuroses can be produced experimentally. Experimental neuroses have been produced in human beings (Watson and Rayner,[16] Krasnogorski[8]); but animals are obviously more suitable subjects as it is easier to control experimental conditions and so determine what factors are aetiologically relevant. Those who are in the habit of regarding human behaviour as mediated by a non-material entity called 'mind', that somehow controls the material body, often find it difficult to accept that an animal neurosis is really a *neurosis*. Yet, so strikingly similar to the human is the behaviour of neurotic animals that even psychoanalytic writers like Masserman[10] and Fenichel[3] have regarded the animals as genuinely neurotic.

Animal neuroses have to date been produced by more than a dozen different experimenters whose work has been reviewed elsewhere.[19] Basically, the methods employed have been two: the presentation of ambiguous stimuli under conditions of confinement; and the presentation of noxious stimuli under the same conditions.

A characteristic experiment employing ambiguous stimuli is the well-known one of Pavlov,[14] in which a dog was always given food when a luminous circle was projected on to a screen in front of him, and never given food at the projection of an ellipse. After positive and negative conditioned responses had been firmly established to the figures, the ellipse was made more and more closely to resemble the circle from session to session. Eventually the dog 'broke down' completely, showing the most intense fear and avoidance of the experimental situation.

Typical of neuroses produced by noxious stimuli have been those described by Masserman[10] and by the present author,[19] in which the essence of the method was to shock cats in a small cage* using a current too weak to cause tissue damage. On being shocked, the animals exhibited marked reactions which differed from case to case but of which the keynote was always anxiety.† When an animal was brought to the cage on a subsequent occasion it showed reactions very much like those that had been seen at the time of shocking. The reactions included resistance to being put into the experimental cage, muscular tenseness, mydriasis, refusal to eat meat pellets even after having been starved during the previous 72 hours, and hypersensitivity to 'indifferent' stimuli. Certain animals displayed such additional reactions as howling, crouching, pilo-erection, trembling, urination and tachypnoea. One cat jerked his shoulders strongly every few seconds while he was in the experimental cage. It is important to note that this animal jumped through a hatch that had been left open by mistake on the first occasion on which he was shocked, and the jerking strongly suggested an abortive jumping movement. The various symptoms were manifested at high intensity even after months of freedom from experimentation, or if, alternatively, the animals were replaced in the experimental cage day after day without further shocking. Symptoms were also elicited, though less strongly, everywhere in the experimental room, and yet more weakly in rooms that to the human eye had some resemblance to the experimental room.

It has already been indicated that the above reactions were of the same pattern as those originally evoked by the shock. Obviously this is an example of learning as defined above, for stimuli from the experimental environment had acquired the power to evoke reactions which they could not have evoked before. The great strength of the reactions evocable by these stimuli even though the animal may previously have had only two or three shocks is attributable to the high measure of drive reduction (reduction of central neural excitation), which occurred when stimulation ended at the cessation of each shock. In the Pavlovian type of experiment the animal had to be subjected to the ambiguous stimulus situation many times before he developed a neurosis, presumably because the measure of anxiety excitation was relatively low.

WHY NEUROTIC RESPONSES ARE RESISTANT TO EXTINCTION

Responses that are unadaptive usually undergo extinction by a mechanism that is associated with fatigue. However, this mechanism is effective only if the drive antecedent to the response continues in unabated strength after the cessation of the response. Extinction does not occur when an activity is followed by reduction of its antecedent drive.

When stimuli such as those in the experiments just described become able to produce anxiety responses, they necessarily produce anxiety drive (with concomitant central neural excitation) as an antecedent. This drive is reduced each time the organism is removed from the action of the relevant stimuli. Any responses that may have been occurring at such a time will be reinforced, and their fatigue-associated tendency to be extinguished will be counteracted.*** Frequently repeated or continuous consequents of the anxiety drive, of which the autonomic responses are an example, are much more likely to coincide in time with drive reductions than are responses that occur only ocasionally. Thus, in the animal experiments, the autonomic responses, whose evocation was continuous, were reinforced every time the animal was removed from the experimental environment; whereas such intermittent responses as clawing the sides of the cage were unlikely to be reinforced and so were soon extinguished. It is important to note that the autonomic responses were reinforced even though they did not themselves bring about removal from the situation.

* Masserman thought that conflict was essential to the production of the neuroses because his animals were first trained to make conditioned feeding reactions in the experimental cage; but the present author obtained the same results by shocking animals that had not had any such preliminary food-training.

† 'Anxiety responses' are the various responses, skeletal and autonomic, which go with withdrawal responses, and which, according to circumstances, are given such names as fear, disgust or horror.

*** The idea of anxiety drive reduction as a reinforcing agent originated with O. H. Mowrer[11, 12]. However, his mentalistic elaboration of the idea differs materially from that presented here.

CLINICAL NEUROSIS IN THE LIGHT OF EXPERIMENTAL FINDINGS

The inference to be drawn from the above is that anxiety drive and its reduction are the basis of human neuroses. The constancy of anxiety in the case histories of patients is in keeping with this inference. Furthermore, in the clinic, as in the laboratory, traumatic situations (i.e. situations to which there is an avoidance response) or situations of conflict, or both, are generally to be found in the history of the neurotic subject. The experiments throw light on a good many clinical phenomena, some of which will be briefly discussed.

i. *The Factor of Confinement.* All animal neuroses have been produced in circumstances that included constriction of space. The importance of this is twofold. First, prevention of an effective escape response seems to have the effect of increasing the intensity of anxiety drive, and consequently the magnitude of potentially reducible central neural excitation (drive). Second, the drive reductions occur in the presence of a limited number of stimuli, and the anxiety responses are conditioned to these in greater strength than would be the case if the environment were a changing one.

In this there is a close resemblance to the conditions in which many human neuroses develop. Without being confined physically, a human being may be kept in an anxiety-producing situation by the force of habits previously learned. For instance, the man who gets entangled with a woman he does not want may be unable to escape from the situation because his previous training makes it impossible for him to let a girl down. One of my own cases discovered one day that his fiancée had once suffered from a form of mental disorder that was liable to recur. He had an intense desire to break off the engagement, but was unable to do so chiefly because the girl had broken a previous engagement to come to him. He developed a severe anxiety state.

ii. *Conditioning of Neurotic Responses to New Stimuli.* Clinically it is frequently observed that the number of stimuli capable of evoking neurotic responses may progressively increase. Sometimes the increase is only apparent, because, due to generalization, stimuli similar to those to which anxiety responses have been conditioned will also evoke the responses to some extent. But a spread of responsiveness to previously 'indifferent' stimuli may be noted. For instance, a patient of mine was severely shocked when a colleague of his suddenly had an epileptic fit in a busy street. This was followed by slight persistent anxiety. Because of generalization, he had an intense anxiety reaction some days later when somebody was knocked down bleeding in a street fight. After that, he had anxiety reactions even at the sight of playful fisticuffs. This phenomenon of secondary conditioning of anxiety responses has been unmistakably duplicated experimentally.[19] The repeated presentation to an animal of an auditory stimulus conditioned to anxiety responses has the effect that contiguous *visual* stimuli also become able to evoke these responses. It is easy to see that reinforcement could have been mediated by the drive reduction that must have followed cessation of the auditory stimulus. It is reasonable to suppose that in human beings 'spread' occurs by an essentially similar process.

It may be remarked that so-called free-floating anxiety occurs when anxiety responses have been conditioned to numerous common stimuli such as room walls.

iii. *The Symptomatic Variations of Neuroses.* The symptomatology of the human neuroses is extremely rich and much more varied than that thus far observed in animals. Yet even animals display considerable variations over and above the basic manifestations of anxiety. Especially noteworthy have been the depressed, 'negativistic' demeanour of some animals, and the tic-like shoulder movements of one animal that it seemed justifiable to call 'hysterical'. The animal displaying these tic-like movements was able to jump out of the experimental cage the first time he was shocked; and the subsequent shoulder movements resembled a 'getting-ready-to-jump'. Such cases strengthen the general conclusion that the responses that characterize a given case of neurosis have, to begin with, the same basic form as the responses that occurred at the time of inducing the neurosis. Later, new responses may be secondarily conditioned to stimuli that already evoke neurotic responses just as (see previous heading) new stimuli may be secondarily conditioned to neurotic responses already evoked by other stimuli.

It may be presumed that the same kind of factors determine the variations in human neuroses. With an explanation of this kind at hand the psychoanalytic idea that a mind entity purposively selects the organ to be afflicted with a neurosis[2, 4, 17] seems all the more unnecessary.

iv. *Psychotherapy.* Neuroses have been treated by very many different methods. The psychotherapeutic interview forms the core of most present-day therapy. Interview techniques include such diverse methods as traditional counselling, suggestion, semantics, narcosynthesis, hypnosis, psychoanalysis, psychodrama, and relationship therapy (Snyder[15]).

Each technique has its own theoretical backing or rationale, and each is able to claim respectable therapeutic results. It is therefore important to be able to evaluate the relative effectiveness of the various types of interview. The only formal investigations that appear to have been done are those that compare the results of psychoanalysis with the results of routine treatments in hospitals or clinics. But this particular kind of comparison is perhaps of special value in view of the insistence of the psychoanalysts that psychoanalysis alone constitutes fundamental or 'deep' therapy. Oberndorf[13] found that whereas 60% of 952 patients from three psychoanalytic institutes had recovered or had greatly improved, a follow-up study of 100 cases of neurosis treated in New York Hospital by various techniques, including non-psychoanalytic interviews, revealed that 46% of the patients had recovered, 5% were much improved, and 15% improved. Landis,[9] in an elaborate study in which the therapeutic results of four state hospitals and one psychoanalytic institute were compared, found very little difference in the effectiveness of the cures obtained. Similarly, Wilder,[18] from a still more exten-

sive study, concluded that the differences in results of psychotherapy between hospitals, mental hygiene clinics, psychoanalytic institutes, private psychoanalysts, and private psychotherapists were not impressive.

The fact that physchotherapeutic interviews of diverse kinds are more or less equally effective, at once suggests that *the effective factor is something that is common to all of them.* Experience in the treatment of animal neuroses clearly indicates what the effective factor may be. There is a method of therapy that is completely successful in every case of neurosis in the cat. This consists of reinforcing to the anxiety-producing stimuli alternative responses that are incompatible with anxiety responses. Feeding is the alternative response employed. As stated above, in neurotic cats feeding is altogether inhibited in the experimental cage and anywhere in the experimental room; but the inhibition, *pari passu* with other neurotic symptoms, is less marked in other rooms resembling in some measure the experimental room. By trial and error a room is found in which the animal will eat although displaying some anxiety. If the animal is repeatedly fed in this room it is found that he quite soon eats in another room in which he would not have eaten before. It is thus possible to work back day by day until at last the animal eats in the experimental room and then in the experimental cage, eventually showing no trace of anxiety there. It would appear that an alternative response incompatible with the anxiety responses inhibits these responses by inhibiting and thus reducing anxiety drive. The drive reduction makes possible the establishment of neural connections subserving a learned inhibition of the anxiety as a response to the particular stimuli that were antecedent to it at the time.

It is easy to see that in the therapeutic interview inhibition of anxiety responses may be occurring in an analogous way. In the interview, the responses of the patient to the therapist are likely to be of considerable strength because of the emotions bound up with the desire and hope to be cured and with attitudes to the therapist aroused by the therapeutic situation. If the patient is exhibiting neurotic responses at the time of the interview (and these may easily be evoked by verbal means) the responses that the therapist evokes in the patient may inhibit the former to some extent. The anxiety drive reduction involved mediates the development of some measure of learned inhibition of the neurotic responses. In some cases it is patent that this is what is occurring. For instance, a young man who suffered from a severe stutter in certain distressing situations, would also during interviews stutter when beginning to talk about any such situation. But as he went on, and obtained new slants on various aspects of the situation, the stutter would disappear and he would relax and would often laugh happily. As the interview progressed, further unpleasant narrations evoked less and less stuttering. From week to week the patient showed steady general improvement. It seems clear that individual inhibitions of the anxiety and the stutter that accompanied it were in this case correlated with a gradually developing learned inhibition of anxiety as a response to a particular group of stimulus situations.

It is an obvious inference that techniques ought to be sought by which this learning of inhibition of neurotic responses may be accelerated. The dramatic improvement which often follows the 'abreaction' produced by such techniques as ether narcosis is apparently associated with an unusually high degree of central neural excitation. Investigation of the effects of ether narcosis in the light of the present hypothesis is now being undertaken here. New tactics for dealing with patients in the hypnotic state are also projected.

Of course, the unlearning of human neurotic reactions does not occur only during therapeutic interviews. Responses incompatible with anxiety responses also occur in life situations, with similar beneficial effects. It is for this reason that neuroses are not infrequently found to undergo 'spontaneous cure'. The therapist can often make good use of the life situation by suggesting to the patient carefully thought-out new modes of behaviour. Many therapists make such suggestions obliquely, though some of them would perhaps deny that they make them at all. Some interesting cases in which the therapist has deliberately influenced the behaviour of the patient by means of advice have been described by Herzberg.[5] The present writer has had a number of cases in whom rapid progress has dated from some new kind of behaviour in the life situation. This was the case, for example, with a university student suffering from very disabling neurasthenic symptoms of many years' standing, which were found, on investigation, to be a reaction to his mother's complaining, carping attitude towards him. Forbidding him to defend himself from her attacks and insisting upon immediate counter-attack was rewarded by a disappearance of his symptoms and an increase of efficiency in every kind of activity within three months.

REFERENCES

1. Culler, E. A. (1938): Psychol. Bull., **35,** 687.
2. Deutsch, F. (1939): Internat. J. Psychoanal., **20,** 252.
3. Fenichel, O. (1945): *The Psychoanalytic Theory of Neurosis,* p. 19. New York: Norton.
4. Ferenczi, S. (1926): *The Phenomena of Hysterical Materialisation.* In *Further Contributions to the Theory and Technique of Psychoanalysis.* London: Hogarth.
5. Herzberg, A. (1945): *Active Psychotherapy.* London: Research Books.
6. Hull, C. L. (1943): *Principles of Behavior.* New York: Appleton.
7. Jones, E. (1948): *Papers on Psychoanalysis,* p. 295. London: Baillière, Tindall & Cox.
8. Krasnogorski, N. I. (1925): Amer. J. Dis. Child., **30,** 754.
9. Landis, C. (1937): *A Statistical Evaluation of Psychotherapeutic Methods.* In Hinsie, L. E., *Concepts and Problems of Psychotherapy.* New York: Columbia University Press.
10. Masserman, J. H. (1943): *Behavior and Neurosis.* University of Chicago Press.
11. Mowrer, O. H. (1939): Psychol. Rev., **46,** 553.
12. Mowrer, O. H. (1940): J. Exp. Psychol., **27,** 497.
13. Oberndorf, C. P. (1942): Amer. J. Psychiat., **99,** 374.
14. Pavlov, I. P. (1927): *Conditioned Reflexes.* Translated by Anrep, p. 290. London: Oxford University Press, 1927.
15. Snyder, W. V. (1947): Psychol. Bull., **44,** 297.
16. Watson, J. B. and Rayner, R. (1920): J. Exp. Psychol., **3,** 1.
17. Weiss, E. and English, O. S. (1943): *Psychosomatic Medicine.* New York: Saunders Co.
18. Wilder, J. (1945): J. Clin. Psychopath. Psychother., **7,** 311.
19. Wolpe, J. (1950): *Conditioning and Neurosis.* MS. To be published.
20. Wolpe, J. (1950): Psychol. Rev., **57,** 19.

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VAN DIE REDAKSIE

DIE ALOMTEENWOORDIGHEID VAN DIE VROULIKE GESLAGSHORMOON

Die byna universele verspreiding van die vroulike geslagshormoon in plantaardige sowel as dierlike stowwe is een van die merkwaardige ontdekkings van die afgelope twee dekades. Stowwe met oestrogeniese aktiwiteit is afgeskei van die water en modder van die Dooie See, van aardpik, steenkool en petroleum sowel as van die modderbaaie van Pystian en ander gesondheidsoorde.[1] Die modderbevattende mineraalwater van Salice bevat 20 Internasionale Eenhede oestrogeen per liter. Die ‚fango' van S.Andrea en Salice bevat onderskeidelik 35 en 40 Internasionale Eenhede oestrogeen.[2]

Dit was moontlik om hulle te ontdek weens hulle uiters hoë kragtigheid. Hierdie buitengewoon sterk inwerking van oestrogeniese stowwe het as gevolg dat hormoonfabrieke ook sekere gevare inhou. Manlike werkers wat oestrogeniese stowwe voorberei en wat gedurig aan die uitwerking van hierdie hormoon blootgestel is omdat hulle oestrogeniese stofdeeltjies inasem in die laboratoriums waarin hulle werk, was ontsteld om te ontdek dat hulle borste onverwags begin ontwikkel en daar het dus 'n nuwe nywerheidsgevaar ontstaan wat egter maklik die hoof gebied kan word.

Een van die heel jongste bronne van die vroulike geslagshormoon wat onlangs aangekondig is, is die wortel van die soethoutplant. Alhoewel daar gesê word dat die huidige metodes om die hormoon van die soethoutwortel af te skei ingewikkeld is, kan die proses na alle verwagting vereenvoudig word.

Dit is welbekend dat soethoutwortels eeue lank gebruik is vir die vervaardiging van strelende kruiepreparate vir keelaandoenings en soethout word vandag dikwels gebruik om tabak, lekkers, bitter geneesmiddels en ander produkte te geur.

Die oestrogeen wat in soethout gevind word, is van die oestriolsoort. Hierdie vorm van die hormoon is kragtig wanneer dit deur die mond ingeneem word en beloof om die beskikbaarheid van hierdie kragtige terapeutiese stof te vereenvoudig en dit nog goedkoper te maak. Soethoutwortel kan geplaas word by die lang lys van plantaardige stowwe waarin spore van die vroulike geslagshormoon gevind is, nl. hawer, suurdeeg, kersies, stuifmeel van die dadelpalm, die katwilger en knoffel.

1. Zondek, H. (1944): *Diseases of the Endocrine Glands.* Londen: Edward Arnold en Kie.
2. *Excerpta Medica,* Deel III. *Endocrinology,* 1950. **4,** 161.

EDITORIAL

THE UBIQUITY OF THE FEMALE SEX HORMONE

The almost universal distribution of the female sex hormone in plant as well as in animal materials is one of the more remarkable discoveries of the last two decades. Materials having oestrogenic activity have been recovered from the water and the mud in the Dead Sea, bitumen, coal and petroleum, as well as in the mud baths of Pystian, and other resorts.[1] The mud-containing mineral water of Salice contains 20 International Units of oestrogen per litre. The ' fango ' of S.Andrea and Salice contains 35 and 40 International Units of an oestrogen respectively.[2]

Their detection has been possible because of their extremely high potency. This extraordinarily great activity of the oestrogenic substances has not been without its risks in hormone factories. Male workers preparing oestrogenic materials, and chronically exposed to the effects of this hormone by inhalation of oestrogenic particles in the laboratories in which they worked, have been dismayed to discover the unexpected development of the breasts, thus producing a new industrial hazard which, however, could readily be coped with.

One of the most recent sources of the female sex hormone has recently been reported as the root of the licorice plant. Although present methods of extracting the hormone from the licorice root are said to be complicated, there is every expectation that the process can be simplified.

It is well known that licorice roots have been used for centuries in the manufacture of soothing herbals for throat ailments, and licorice is widely used to-day for flavouring tobacco, sweets, bitter drugs and other products.

The oestrogen found in licorice is of the oestriol type. This form of the hormone is active by mouth and promises to simplify and cheapen still more the availability of this potent therapeutic substance. Licorice root can now be added to the long list of plant substances in which traces of the female sex hormone have been found, viz. oats, yeast, cherries, date pollen, pussywillow and garlic.

1. Zondek, H. (1944): *Diseases of the Endocrine Glands.* London: Edward Arnold & Co.
2. Excerpta Medica, Section III. *Endocrinology,* 1950. **4,** 161.

PROCEDURES IN THE CONTROL OF TUBERCULOSIS

THE PRACTICAL APPROACH: 4. DIAGNOSIS AND TREATMENT

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In South Africa the European is like his counterpart in any other country. An accurate history is the most important part of the diagnosis in his case. He complains early in the course of the disease and an intelligent practitioner will proceed to clinical, bacteriological and radiological examination without delay. Even when the European case is discovered fortuitously, as in a routine X-ray of students, the question of treatment is usually a matter of no difficulty.

ILLUSTRATIVE CASES

1. A young European male (21 years) had complained of lassitude, loss of weight, palpitation, malaise for over *six months*. He was regarded as a neurotic until he had a small haemoptysis and then his chest was X-rayed. The X-ray showed infiltration in the first right interspace and second left interspace, with accentuated lung markings to the left root. His sputum contained tubercle bacilli (Fig. 1).

2. A student of medicine was discovered to have tuberculosis when his regular yearly X-ray was taken. This showed infiltration and cavitation in the 1st and 2nd right interspaces (Fig. 2). His sputum contained tubercle bacilli. He had been feeling tired and off colour for some weeks. Treatment consisted of postural rest only (raising the foot of the bed 14 inches) and six months later he was well and his sputum was negative. X-ray (Fig. 3) shows no evidence of tuberculous disease.

However, in the Bantu, particularly the Urban Bantu, the primitive in our land and in the continent of Africa, an individual reports sick only when his physiological machine collapses and refuses to work. At this stage his tuberculosis is advanced and disseminated and most often hopeless from the point of view of treatment. Diagnosis is then easy, clinical examination, bacteriological examination and X-rays all tell the same tragic tale and the end result is a short stay in hospital and death.

A young Bantu male (28 years) was working loading ships. This was really heavy physical effort for 8 hours a day at least. He felt well until *six weeks* before admission and strenuously denies any feeling of malaise, lassitude or other symptoms of illness before this.

In the six weeks preceding admission he began to feel languid and off his appetite, felt feverish and coughed. He presented himself for examination. His general condition was good and he was well nourished. X-ray showed an extensive, bilateral, confluent, miliary type of tuberculosis (Fig. 4). He died a month after admission.

The World Health Organization Expert Committee on Tuberculosis says that mass X-ray is not justified in primitive communities, mainly because large numbers of known cases exist and there are no beds for them. In its mind the mere search for new cases would serve no practical purpose. However, if nurses and beds can be made available, as is shown in our first papers, is it not time to turn to mass radiography and tuberculin testing of suitable population groups (the urban Bantu) to find cases in a treatable state? Mass X-ray surveys combined with tuberculin testing will reveal all potential and active cases and would give the early case a chance of recovery. The primitive will learn if we can be bothered and have the patience to teach him and demonstration of cure is the best form of teaching.

Tuberculin testing as part of a mass X-ray programme is extremely important for the following reasons.

1. Repeated tuberculin testing of various age groups in any environment will give accurate information as to the efficiency of tuberculosis control measures. A falling percentage of positive reactions means good control, a stationary or rising percentage of positive reactors means inefficient control.

2. A negative reactor in most instances rules out tuberculous disease as the cause of a particular illness.

The successful treatment of an early case of tuberculosis in the Bantu in urban areas is different from that of a similar case in Europeans. One important difference is the numerous other conditions the non-European in this country has to face. Intestinal parasites, venereal disease, vitamin deficiencies, all contribute to the rapidity of progress of tuberculosis and these accompanying conditions must be treated simultaneously with the tuberculous disease or success will not result. Another is the fact that conservative measures, for example bed rest and diet are not generally effective, except in primary disease, in the urban primitive, even in early cases. There is generally an inexorable marching on of the disease in spite of rest and diet and the fact that the disease spreads rapidly to the liver, kidneys, spleen, intestines and other parts of the body is usually overlooked.

A young Bantu woman, a nurse in her final year, was found on the routine X-ray, to have two small cavities, one under the first rib on the right and one under the first rib on the left (Fig. 5). She was in excellent general condition and felt well. She was put to bed on complete rest and given a high protein, high vitamin diet. A month later there was considerable extension of the disease especially in the right upper lobe (Fig. 6). Six weeks after the second plate the disease had affected the whole of the right lung (Fig. 7) and two months later the patient was *in extremis* with extensive bilateral disease (Fig. 8).

Pneumothorax is not a very successful method of treatment because the type of disease is unsuitable, bronchial ulceration and oedema is frequent, pleural tuberculosis is common and the result of artificial pneumo-thorax is adhesions, fluid, black lobes, and empyemata in distressing numbers and again the presence of disseminated disease is ignored when treating the lungs alone.

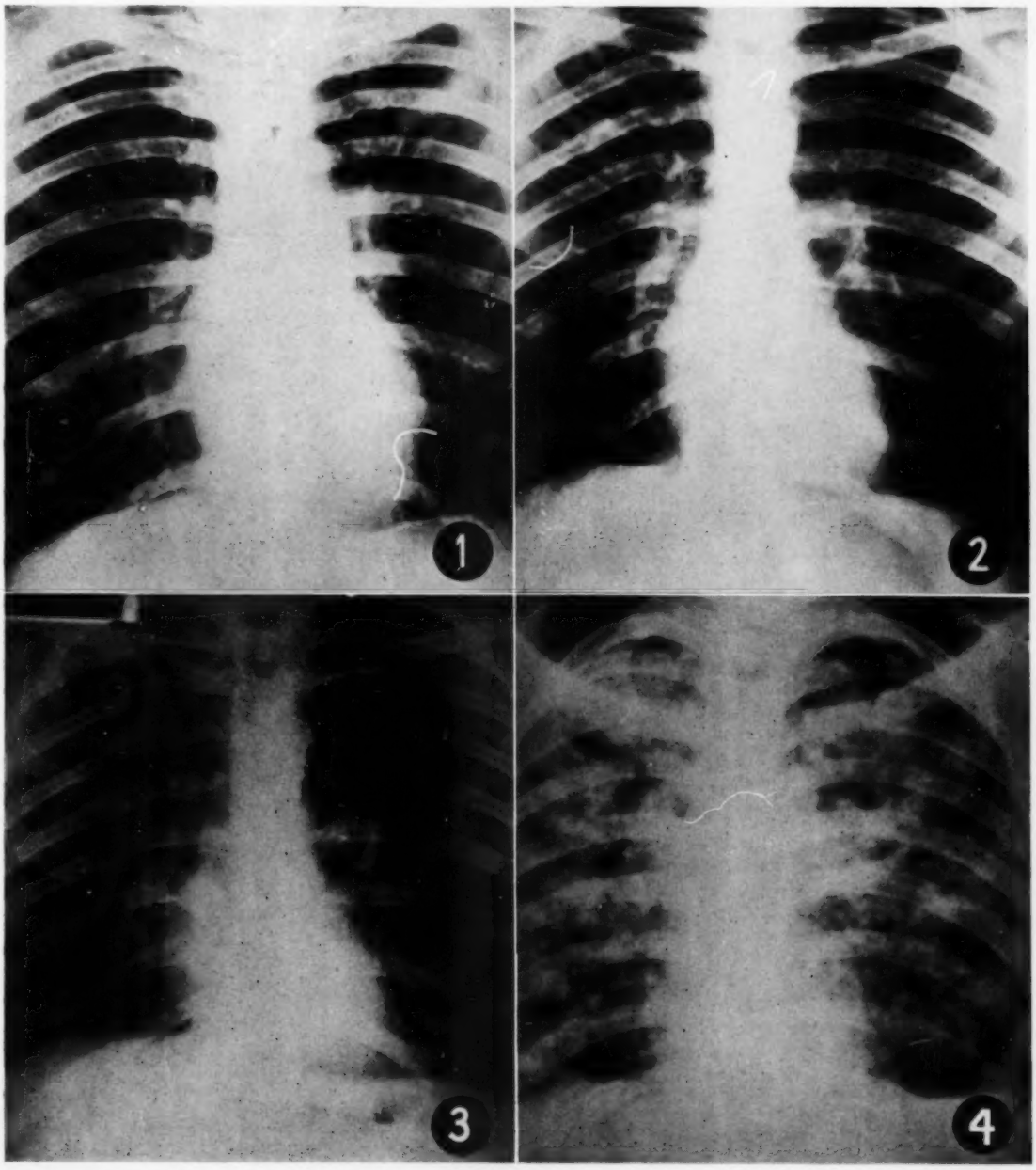
Pneumoperitoneum has similar disadvantages as has thoracoplasty, extrapleural pneumothorax, etc.

After a long experience we have in King George V

Hospital at least, come to the conclusion that the *early* case in the Bantu must be treated vigorously and actively by means of antibiotics, chemotherapeutic agents and, if necessary, surgical resection of remaining isolated foci of disease at a chosen moment.

Advanced cases are not treatable and should therefore be made comfortable and, if possible, happy.

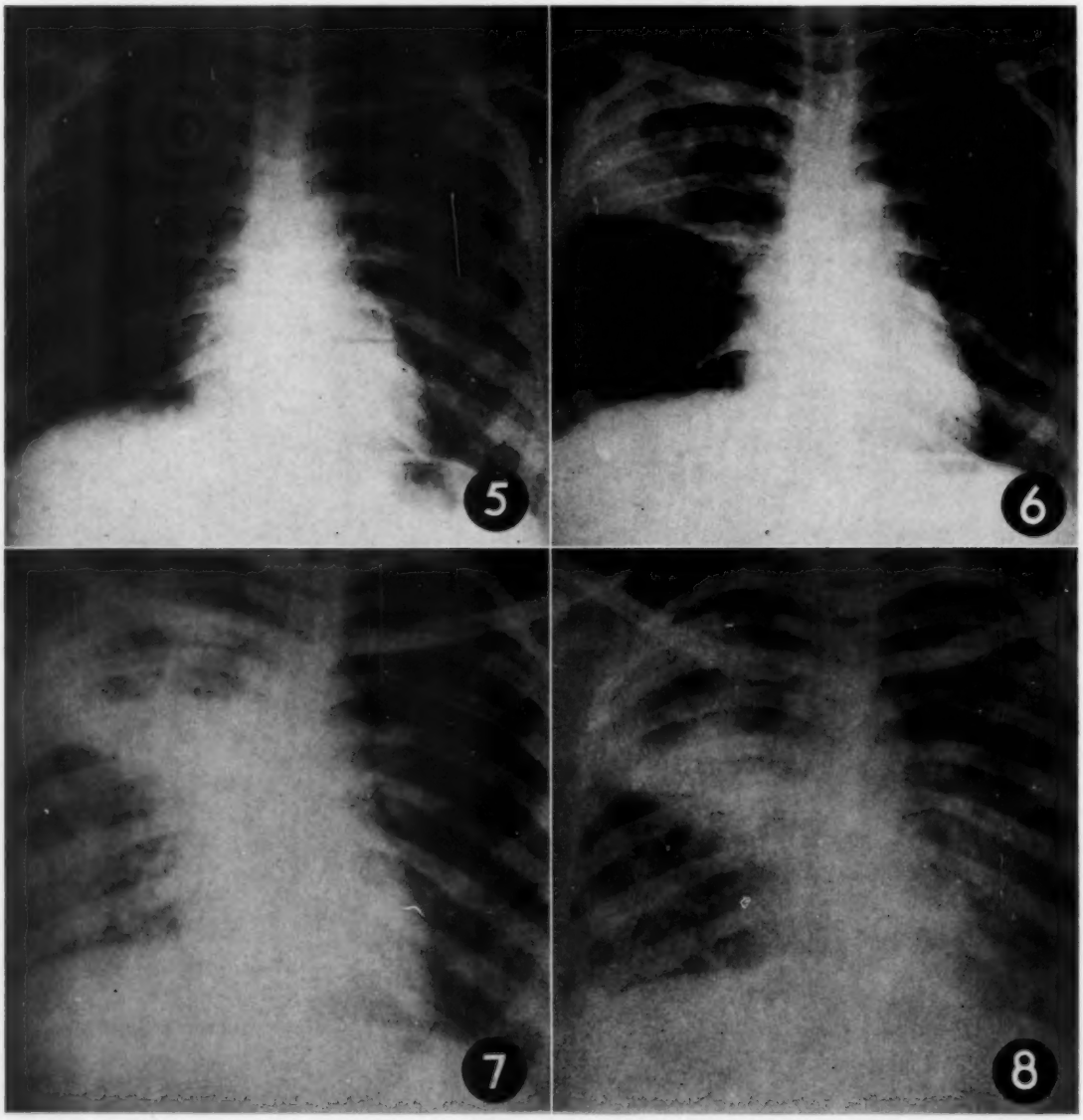
A Bantu nurse aged 22 years was found, on routine X-ray examination, to have soft infiltration in the right mid-zone and a cavity under the first rib on the right (Fig. 9). She was put to bed, given streptomycin and in five months her sputum had been converted from positive to negative and her infiltration had disappeared (Fig. 10).



An interesting facet is the occasional tendency to fibrotic disease in the truly rural Bantu where living

conditions approximate those of the European, i.e. a reasonably good diet and no physical effort.

A Bantu school teacher in a country district had an irritating cough for years. He was X-rayed because of an haemoptysis and chronic fibroid tuberculosis of the right upper lobe was discovered (Fig. 11). A lobectomy resulted in a complete cure.



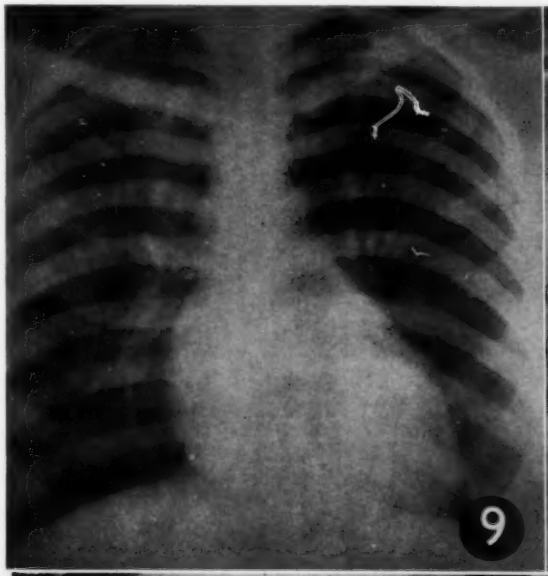
Indian Tuberculosis. The Indian in South Africa, particularly the male, shows considerable resistance to tuberculosis and can be successfully treated on the same lines as Europeans. However, it must be mentioned that Indian women tend to have advanced disease when admitted to hospital and treatment in general is not particularly satisfactory. There are many explanations for this sex difference of Indians.

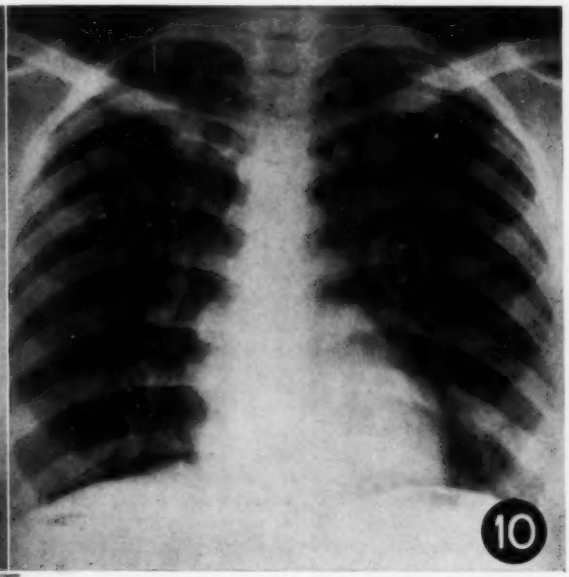
(a) The Indian woman has children soon after puberty and is thus subject to marked physiological strain.

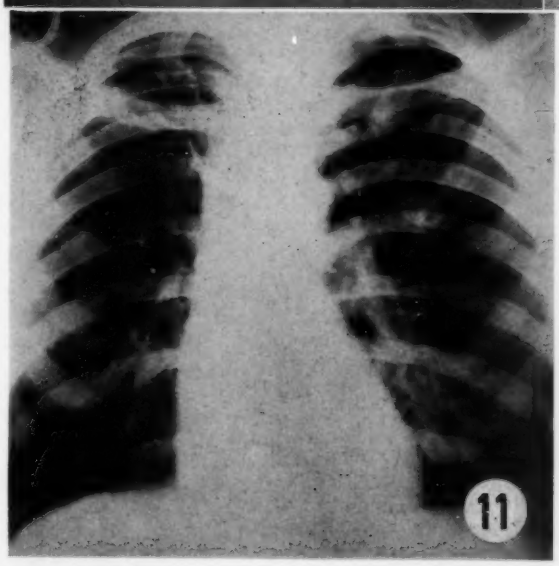
(b) She has numerous children and tends to feed children and husband and partially starve herself.

(c) She works hard and is unwilling to go to hospital and thus seeks medical help when it is too late to be of much help.

The Coloured People. This community seems to be midway between European and Bantu in its reaction to tuberculosis and many can be treated successfully by means of pneumothorax and other collapse measures and, indeed, by resection.







It must be emphasized that quite definitely races differ in their reaction to tuberculosis in different parts of South Africa. In some areas primary infection is not often massive, in other areas calcification is marked in healing, in others not and so, in discussing tuberculosis it is best to specify in whom (race, age, sex) and where (exact area of country where it arose).

A Dane discussing tuberculosis is thinking of Danish tuberculosis, an Englishman thinks of his own country and we know the disease is different in the Irish, the Scots and the English, and so on for all races. If there is to be discussion of global tuberculosis with eventual emergence of important advances, it will be necessary for the World Health Organization to establish a reference library of X-ray plates gathered from all countries of the world and from different parts of each country to establish the type of tuberculosis in each area. This will lead to intelligently informed discussion and maybe a great surging forward of the epidemiological study of tuberculosis.

Primary Tuberculosis. This type of disease seems to react in a similar way in all races in South Africa, although massive primary complex is more common in the non-European as is extensive glandular tuberculosis associated with primary disease. Rest and good food results in cure in the majority of cases. Antibiotics and chemotherapeutic drugs seem to have no effect on these cases and unless used for open sinuses are usually wasted.

The Use of Antibiotics and Chemotherapeutic Drugs. Streptomycin is, in general, abused in South Africa, where its main indication seems to be the ability of the patient to pay for treatment. Streptomycin should be used in European cases of miliary disease, meningitis, laryngeal and intestinal tuberculosis and to prepare exudative cases for planned treatment (collapse or resection). If possible it should be used in conjunction with P.A.S. or Thiosemicarbazone or some similar chemical. Short courses of 1 gm. of streptomycin a day for 42 days plus P.A.S. 10 gm. daily seem to be the most effective. The sensitivity of the patient's organisms to the drugs should be tested after each course.

The indiscriminate giving of streptomycin in South Africa has resulted in a large number of cases with completely resistant organisms—mostly chronic cases who will be a permanent source of danger to others.

Streptomycin plus P.A.S. is singularly effective in the *early* case in the Bantu and should be used for all such cases. These drugs should also be used for relieving the pain of laryngitis and for miliary and early meningitis in all races. They are effective in controlling the numerous stools in enteritis and make nursing of these cases much easier.

SUMMARY AND CONCLUSIONS

European and non-European tuberculosis is contrasted.

Mass X-ray and tuberculin testing are advocated for the urban Bantu in order to discover treatable cases.

The treatment of European and non-European cases often differs.

Primary tuberculosis is similar in its course in all cases.

The use of antibiotics and chemotherapeutic drugs is discussed.

ANTICOAGULANTS IN SURGERY

THE CLINICAL APPLICATION

I. NORWICH, M.B., F.R.C.S., EDIN.

Edenvale Hospital, Johannesburg

The anticoagulants in use to-day are heparin and dicumoral. Although other synthetic substances with similar anticoagulant properties have been discovered, these are not satisfactory for clinical use for one reason and another.

The importance of certain diseases of blood vessels would be greatly lessened if thrombosis was not provoked. Phlebitis would be a very benign disease if it did not cause venous thrombosis, suturing of arterial channels and operations on the cardio-vascular system would precipitate a far greater number of post-operative thrombosis at the site of suturing or operation without the use of anticoagulants. Arteriosclerosis would have less importance if it did not cause coronary and cerebral thrombosis. The two chronic occlusive arterial diseases, thrombo-angiitis obliterans (Buergers' disease) and obliterating arteriosclerosis, would not impair greatly the arterial circulation to the extremities if thrombosis were not part of them. There would be no pulmonary embolism if blood would not clot inside blood vessels, the gangrene of trench foot and immersion foot would be avoided in many instances. The use of anticoagulants is a step in the prevention of intravascular thrombosis.

The disadvantages of heparin are its high cost and the need for parenteral administration. The disadvantages of dicumoral are the need for a relatively complicated procedure to determine its anticoagulant effect, the delay in effect after administration (24 to 72 hours) and the continuance of its effect after the administration has been stopped. Disadvantageous as both heparin and dicumoral are, their use represents the first steps in the direction of securing satisfactory anticoagulants for clinical use.

The Value of Anticoagulants in Surgery is Indicated in the Following Conditions: 1. *After a non-fatal pulmonary embolism post-operatively, or after a patient has been laid up for some time.* A satisfactory anticoagulant effect is obtained to prevent further emboli which may prove to be fatal.

2. *In thrombophlebitis and phlebothrombosis* to prevent further venous thrombosis and pulmonary embolism.

Sudden death during convalescence has always been a disturbing episode. Massive pulmonary embolism from the leg veins is the most common cause of this catastrophe. In the middle twenties, reports from large clinics showed that three persons in each 100 subjected to surgery would die during convalescence. Much was done to prevent these deaths and by careful attention to frequent changes in posture and efforts directed to diminish stasis in the leg veins the ratio of fatalities from embolism was reduced to approximately 1:800. This, however, is only one aspect because those that recovered post-operatively after prolonged illness and post-partum, suffered a prolonged convalescence brought about by the thrombophlebitis with post-phlebitic oedema and subsequent leg ulcers so frequently seen years later. Efforts to prevent serious sequelae from thrombosis of the leg veins have led to the search for other methods to prevent the thrombosis in the first place and, if thrombosis occurs to prevent disability and death from massive embolism. Early post-operative ambulation appears to have reduced the incidence of thrombosis. Once thrombosis has occurred, the method of treatment, whether by deep femoral vein ligation or by the administration of anticoagulants (heparin and dicumoral) has been the subject of much debate.

It is preferable for practical and clinical purposes to label the process of thrombophlebitis and phlebothrombosis with pulmonary emboli as thrombo-embolic disease. Pathologically, phlebothrombosis is distinguished from the more inflammatory process of thrombophlebitis, but clinically this may be difficult. It is preferable to refer to them collectively as deep venous

thrombosis. The etiology of deep venous thrombosis is still unknown. Increased clotting and increased platelet count merely denote the results of an increased clotting tendency in the blood. Prolonged immobility of a patient, either post-operatively or for medical reasons, predisposing to a sluggish and stagnant blood flow, was formerly considered to be a potent factor. Although the incidence of thrombo-embolic disease has been considerably reduced by post-operative early ambulation and medical gymnastics it still exists with mortalities in disturbing numbers. According to the large Scandinavian clinics,[1] the figures show that 1:170 patients or 0.6% of surgical cases still develop thrombo-embolic complications. This figure, however, has been reduced and it is possible, according to their figures, to reduce the frequency of post-operative thrombosis by one half to one third of the original figures by appropriate early ambulation. Early post-operative ambulation and medical gymnastics, however, have not eliminated thrombo-embolic phenomena completely. As regards mortality, thrombosis has remained at its original level and is likely to remain at that level as long as regular therapy with anticoagulants is not applied.

Until recently therapies have differed, one school advocating ligation or vein interruption and the other the use of anticoagulant therapy. Prophylactic ligation has been practised.

Allen[2] and his co-workers at the Massachusetts General Hospital, Boston, have used surgical ligation treatment almost exclusively. They have a wealth of clinical material (over 12,000 ligations performed up to February 1946) and briefly these are the views of this school.

Ninety-five per cent. of thrombosis develop initially in the legs and from here the thrombi propagate with emboli becoming detached; 2-3% commence primarily in the pelvic veins, the rest occurring in the renal vein and in the heart. At the Massachusetts General Hospital the age-incidence is interesting; over 80% of the cases were in the 40 or over age group. Comparative figures have shown that the age incidence has increased by eight years in the past 13 years. This may increase the problem in future years. Almost one third of all deep femoral vein thromboses develop pulmonary infarction and the death-rate has been 4 to 5%; in other words, it is still a serious disease. The methods of diagnosis showed that one third commence initially with signs of pulmonary infarction, and the typical leg signs with pain in the calf and oedema, etc., occurred in the remaining two thirds. Daily measurements of the size of the calf muscles is carried out routinely post-operatively. A positive Homan's sign (pain in the calf by flexing the ankle with the patient lying down and the knee extended) is valuable when it is elicited. Allen describes a 'chart sign' as almost pathognomonic, i.e. small simultaneous rises in the temperature, pulse rate, and respiration. This has been positive in 80% of cases and many patients develop the other signs a few days later. Phlebograms have been given up at the Massachusetts General Hospital for the past few years as being unnecessary and almost valueless.

The Boston group of workers has treated these lesions by ligation of the deep femoral vein. They have considered and used, from time to time, other anticoagulant measures, but ligation is still the treatment of choice, except in the very few selected cases and in the old. Ligations are done both prophylactically and post-operatively. For certain pelvic operations and pinning operations for fractures of the neck of the femur these ligations of the femoral vein are done prophylactically before any other surgical measures are carried out. The operation has to be bilateral to be of any value. At the Massachusetts General Hospital the femoral vein is usually divided below and distal to the deep branch. Experience has shown that this technique produces less swelling post-operatively. The use of a glass sucker to remove all the clot from the femoral or iliac vein is very necessary. On a few occasions the inferior vena cava has been ligated for thrombosis at the bifurcation of the iliacs. The vena cava ligations are, however, being given up as they have produced a post-phlebitic type of lesion with oedema and ulceration.

A great majority of the recognised clinics in Boston accept this form of therapy for venous thrombo-embolic diseases with individual modification of actual technique or optimum time for the ligations, but it is ligation in preference to the conservative use of anticoagulants. The objection to the use of heparin and dicumoral is based on a wealth of clinical experience. Heparin must be administered intravenously and continuously, which requires constant supervision. Repeated clotting time for heparin and prothrombin times and percentages for dicumoral must be determined to avoid haemorrhage with possible fatal results. Many such haemorrhages have occurred, some of which have been fatal. Again, experience has shown the Boston workers that at the end of a rigorous and prolonged regime of anticoagulant therapy pulmonary infarcts have still been noted. Heparin in Pitkin's menstruum[16] is not favoured by these workers, although this method requires only one intramuscular or subcutaneous injection. Dicumoral is not used because of the difficulty of controlling the bleeding time. Fatalities have occurred with anticoagulants at the Massachusetts General Hospital. The protagonists of the ligation treatment maintain that post-ligation oedema may occur, but it is minimal if the vein is interrupted below the deep branch, and that if oedema does occur, it never lasts longer than about six months with proper bandaging and exercises. If oedema does persist for a longer period than this, it is maintained that there has been an extension of the inflammatory process to other important channels of the venous return.

In spite of these convincing facts and figures emerging from such vast clinical experience, there is a large school antagonistic to this ligation treatment.[3-5] These workers maintain that all venous thrombo-embolic disease should be handled in one way or another by means of anticoagulants and ligation should be reserved for the exceptional case.

Silbert[6] has seen cases of severe persistent oedema of the lower limbs following vein ligations. Such per-

sistent oedema, especially in young women, is a most distressing complication, the more so when it occurs bilaterally. It is his feeling that the use of anticoagulants is the treatment of choice.

The Mayo Clinic strongly favours the use of anticoagulant therapy for both prophylactic and therapeutic purposes. These workers report on 1,000 post-operative cases using anticoagulants both before and after operation, with only one fatality. Others maintain, however, that many such series without any such anticoagulant therapy may show no fatalities over the same number of cases and that many more thousands should be reviewed before coming to any real decision. Allen maintains that, although very little is known about the etiology of venous thrombo-embolic disease, this process is similar to clotting anywhere else in the body and that ligation takes care of only one part of the body. This tendency of venous clotting should, therefore, be treated with a general anticoagulant therapy rather than with a localized attack. Recent work has suggested that thrombosis occurs spontaneously in the pulmonary veins and venules; this is a potent argument against ligation. This pathological process may explain why pulmonary infarcts occur without any leg signs. It also indicates the need for a generalized systemic attack rather than a localized treatment directed towards the lower limbs only. Since 1940 Bauer and his associates have used intensive heparin therapy and early mobilization. Extensive use is made of phlebograms to diagnose the venous obstruction long before embolic signs present. Experience revealed that although painful calves and some slight swelling have always been regarded as a definite sign of thrombosis, phlebography showed in one third to a half of these cases the veins were free from thrombosis and that intensive heparin therapy was unnecessary. Phlebogram examinations in this series of about 600 cases confirmed the clinical diagnosis and provided evidence that acute venous thrombosis of the deep veins of the leg occurs in about 98% of the cases in the veins in the calf, and propagation of the clot extends proximally. Heparin is administered without investigation of the clotting time of the blood. Forceful active movements of the leg are insisted upon from the first day and the patient is allowed out of bed on the day before or the day the heparin treatment is discontinued. Supportive bandaging or pasteboots are advisable. The mortality has been reduced considerably with this method. The Scandinivian workers have also shown that in all probability the heparin-treated patients will escape the troublesome post-phlebitic complications, permanent swelling of the leg, associated with a bursting feeling or fullness and pain, pigmentation, induration and post-phlebitic ulcers, a syndrome sufficiently well known to medical practitioners. The elimination or alleviation of these disabling complications of the post-phlebitic syndrome is an advance in the management of deep venous thrombosis. Birger[8] studying material from the Swedish Pensions Board concluded that as a cause of incapacity post-phlebitic complications comes a good bit ahead of such important disease groups as tuberculosis of joints or bones and diabetes.

THE CLINICAL USE OF VEIN LIGATION AND THE ANTICOAGULANTS

Experience in the management of thrombo-embolism disease during the past 10 years indicated that the use of the anticoagulants for this condition is the treatment of choice. Vein ligation alone, however, has still a very definite place in the treatment of deep venous thrombosis. Deep venous interruption is indicated where anticoagulants are contra-indicated, in some cases of septic thrombo-phlebitis and also in saphenous vein thrombosis. To protect an amputee from embolism, ligation can be performed of the common femoral vein on the side of the amputation and additional ligation of the superficial femoral on the opposite side.

Combined Anticoagulant Therapy and Vein Ligation. There are also indications for combined venous ligation and the use of anticoagulants, especially in progressive thrombosis or embolism subsequent to one method of treatment, and in patients where anticoagulant therapy is interrupted because of haemorrhage. In intercurrent surgery or intercurrent disease in which anticoagulants are undesirable, vein ligation would have to be performed.

3. *Anticoagulant measures can be employed very satisfactorily for sudden arterial occlusions due either to embolism or thrombosis.* It is well to bear in mind that sudden arterial occlusion in the extremities ordinarily produces much more profound effect on the arterial circulation than does simple interruption in the continuity of a major artery. The ischemia which results is caused in a large part by the spasm of collateral arteries induced by the presence of an embolus. If such ischemia persists for more than a few hours, the intima of blood vessels distally is injured to such a degree that intravascular thrombosis occurs when blood again runs into them. At the Mayo Clinic,[9] 19 patients who had acute arterial embolism were treated conservatively without surgical measures, but with anticoagulants and other measures to relieve arterial spasm. Treatment was begun early in 11 instances; there was recovery of the circulation to the limb in 10 instances. In eight instances treatment was begun more than 24 hours after embolism had been sustained. Recovery of circulation occurred in only two cases. In 16 instances treatment was initiated within 24 hours of the onset of acute arterial thrombosis; recovery occurred in 13 instances. In 10 instances treatment was begun 24 hours or more after the onset of acute arterial thrombosis; recovery of the limb concerned in five instances. These figures emphasize adequately that the early institution of measures to diminish the coagulability of the blood and to relieve arterial spasm, along with avoidance of harmful measures, has greatly brightened the outlook for recovery of limbs affected with acute arterial occulsion. The figures emphasize also the predominant role of medical treatment and the greatly reduced need for surgical treatment of acute arterial embolism.

If surgical removal of an arterial embolus is carried out the anticoagulants are valuable to reduce the possibility of any thrombosis occuring at the site of removal of such emboli.

4. *Traumatic Injury to Blood Vessels.* A decreased coagulability of the blood is obviously valuable for the nutrition of the tissues in a semi-gangrenous part of the extremity. Mechanical trauma to an extremity with a normal arterial supply may seriously impair the blood supply to the distal parts of such a limb. Complicating arterial spasm may be set up in a limb already deprived of some of its blood supply by injury. The anticoagulant therapy together with other measures may be of great value in such cases, after the original traumatic lesions have been treated and provided it is utilized early, before the processes of thrombosis develop. Viability may be restored to limbs about to become gangrenous. Frostbite and early stages of immersion and trench foot could be treated with anticoagulants, to prevent the development of further local thrombosis.

Bauer[10] in a study of thrombosis at the Mariestad Hospital, Sweden, showed that a little over a fourth of all cases of venous thrombosis occur following injuries to the leg. This frequency of the leg thrombosis is doubtless partly due to the prolonged rest in bed. The chief etiological factor according to Bauer is the retardation of the blood flow in the popliteal vein caused by swelling of the soft tissues around the knee. The best treatment of these leg venous thrombosis is preventive by means of active contraction of the leg muscles and raising the foot of the bed. Of the specific agents available for the treatment of an established thrombosis, the anticoagulant heparin is decidedly the best. Of 33 cases of traumatic venous thrombosis in this series only one patient died of a pulmonary embolism before heparin treatment could take effect. Apart from saving life, the anticoagulants in this condition will reduce considerably the serious and disabling post-phlebitic complications already mentioned.

5. *Superior Mesenteric Arterial Occlusion.* In mesenteric arterial occlusion due either to emboli or local thrombosis, heparin has proved to be a valuable adjunct in saving the patient's life. In the pre-heparin era Whittaker and Pemberton[11] cite only one case out of 60 with superior mesenteric occlusion with spontaneous recovery. Since the introduction of heparin, Jorpes[12] quotes Ravdin as having two spontaneous recoveries and Rudberg as having one. More recently Hendry[13] reports a case of recovery without resection, with the use of heparin together with other measures of therapy.

6. *Cavernous Sinus Thrombosis.* Heparin and penicillin are used together for this condition. The early employment of the anticoagulants with antibiotics and the sulphonomide compounds is desirable and recovery of two cases has been recorded.

7. *Anticoagulants in Vascular and Cardiovascular Surgery.* The regional and general use of the anticoagulants, especially heparin, has considerably increased the scope of vascular surgery. Operations on the blood vessels are very often liable to cause thrombosis. The formation of secondary thrombi often spoils the results of arterial embolectomies. Our potentialities in vascular and cardiac surgery have now considerably increased with the aid of the anticoagulants.

8. *The use of anticoagulants in the surgical field has now recently been extended into the treatment of local pyogenic infection;* 24 patients[14] with local pyogenic infections are recently reported to have been treated with heparin with unusually favourable results, especially those with infection of the diffuse phlegmonous character. The rationale for this form of treatment is based on the assumption that the infection-combating powers would have better access to the foci of disease when the thrombus formation in the small vessels and the deposition of the fibrin in the tissues are lessened.

THE PROPHYLACTIC USE OF THE ANTICOAGULANTS

In addition to the therapeutic uses of anticoagulants, they can be employed as a prophylactic measure in the following conditions:

A recent episode of thrombo-embolism and where further immobilisation is contemplated.
Severe trauma and contusions of an extremity, especially where the survival of a limb is in doubt.
Where prolonged immobility or operation is contemplated in an obese subject.
Retroperitoneal tumours.
Operations in the region of major vessels, vascular surgery and operations of the heart and its great vessels.
Pelvic inflammation.
Patients with a history of myocardial infarctions where operation is contemplated.

CONTRA-INDICATION TO THE USE OF THE ANTICOAGULANTS

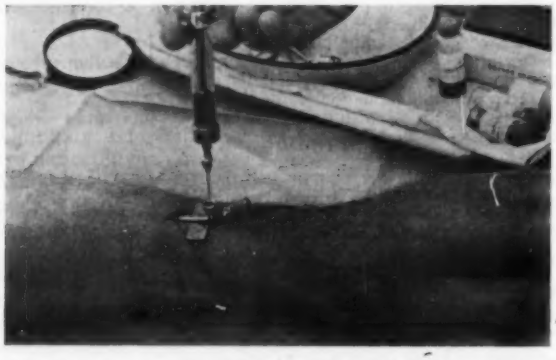
Where no adequate laboratory control exists, especially with the use of dicumoral.
Major renal or hepatic damage.
Ulcerative or granulating lesions which are potential sources of extensive bleeding.
Blood dyscrasias with a bleeding tendency.
Recent cerebrovascular accident.
Recent operation on the brain, or spinal cord, because bleeding in these areas may be disastrous.

Although one's own experience is limited to approximately 180 cases with anticoagulant therapy certain impressions have been formulated. Anticoagulant therapy is the treatment of choice especially for the acute early case of thrombo-embolic disease; heparin is especially indicated. The dramatic sudden relief of pain, the diminution of the oedema and the general well-being of the patient are striking. Apart from the main issue of saving life, heparin has the capacity of reducing the other complications of a deep venous thrombosis especially swelling, pain and post-phlebitic pigmentation and ulcers. These complications appear to be less than with vein ligation. The alleviation of post-phlebitic complications is a great advance. As regards the details of administration of the anticoagulants, heparin is preferred to dicumoral although it is more expensive and until recently it has been more difficult to administer. Heparin acts immediately when injected intravenously reaching its maximum effect in two to three hours, then the body begins to excrete it. It is non-toxic, its action is certain and it requires a simple bedside coagulation time test to determine blood coagulability. The coagulation time should be increased to at least twice or three times the normal. If bleeding does occur with heparin there is an instant and certain antidote in protamine sulphate. Heparin can be administered intravenously and intramuscularly.[15] For the latter method, however, more heparin is required, making it even more

costly. This route can be made effective if given intramuscularly six- to eight-hourly in larger doses than intravenously.

Two intravenous methods are currently in use, the continuous drip method by using a 1000 c.c. vacolitre to which 200 to 300 mg. of heparin is added, the rate of drip commencing at about 28 to 30 drops per minute and the further rate being determined by repeated coagulation time tests. The intermittent intravenous method consists of four-hourly intravenous injections of heparin in 50 to 100 mg. doses.

The Scandinavians have latterly introduced an intravenous indwelling needle (see illustration) which has obvious advantages. The rubber diaphragm is pierced four-hourly or at any other required intervals, which makes it a simple procedure in the hands of the nursing staff.



Indwelling intravenous needle (Olovson's). Needle penetrates rubber diaphragm, without necessitating an intravenous injection each time.

Heparin in Pitkins[16] menstruum is heparin in a slowly absorbing medium of gelatine, glacial acetic acid and glucose and water, with or without vasoconstrictors, and is used by the subcutaneous or intramuscular routes. It is slowly absorbing and may give the desired anticoagulant effect for two to three days, thus requiring only one injection every two to three days. It does have the disadvantage of being rather painful. Because heparin is so costly and because it has to be given parenterally it can be combined suitably with dicumoral. Dicumoral is a more toxic anticoagulant than heparin. The effect of a given dose is highly variable in different individuals. Unlike heparin, dicumoral does not act directly upon the components of the blood; its action affects instead the prothrombin production in the liver and will consequently vary with the resistance of the liver in different persons. Next to the long latent period, the unpredictable effect of the dicumoral treatment is its weakest point. The effect lasts for several days and even up to a week. Large doses may give rise to liver cell necrosis. The *sine qua non* of treatment with dicumoral is an experienced and absolutely reliable laboratory service. The dose of dicumoral is entirely determined by the prothrombin index. This should be a golden rule. Dicumoral well controlled by such tests fulfills the requirements of a satisfactory anticoagulant. It is cheap and can be taken by mouth. It can be very adequately combined with heparin. A satisfactory method of combining the two anticoagulants is to commence the two at the same time and by the time the blood has been heparinized and the pathological process arrested, dicumoral can take over the required coagulability and the heparin be discontinued.

Dicumoral alone as a prophylactic measure can be usefully employed especially post-operatively, when it is commenced on the day of the operation and the desired effect is obtained when the critical period of vascular complication is reached.

SUMMARY

The anticoagulants have come to stay as a treatment for certain definite pathological processes of the venous system.

It is the treatment of choice compared to vein ligation in the thrombo-embolic diseases. There is a place for vein ligation and vein ligation combined with anticoagulant therapy in the treatment of thrombo-embolic disease.

The use of anticoagulants has reduced the mortality of thrombo-embolic disease considerably.

Anticoagulant therapy cannot be used indiscriminately.

Of the two anticoagulants heparin is the safer and more efficient.

Dicumoral under proper laboratory control, however, can be utilized with good effect. The anticoagulants can be very usefully employed as a prophylactic against deep venous thrombosis after operation or prolonged bed immobilization.

The post-phlebitic sequelae of deep venous thromboses are less severe following anticoagulants than following vein ligation.

Heparin has proved to be most valuable in the treatment of certain surgical conditions and for operations on the cardio-vascular system.

REFERENCES

1. Zilliacus, N. (1946): Acta Med. Scand., **171,** 13.
2. Allen, A. W. (1947): Surg. Gynec. Obstet., **84**, 519.
3. Bauer, G. (1946): Svenska Lakartidmingen, **43-46,** 2876.
4. Gordon, Murray (1941): Surg. Gynec. Obstet., **72,** 340.
5. Allen, E. V. (1946): Quart. Bull. Nthwest. Univ. Med., 20 January.
6. Personal communication.
7. Personal communication.
8. Birger, I. (1941): Nord. Med., **12,** 3542.
9. Allen, E. V. (1947): J. Amer. Med. Assoc., **135,** 15.
10. Bauer, G. (1944): Acta Chir. Scand., **90,** 229.
11. Whittaker, L. D. and Remberton, J. de J. (1938): J. Amer. Med. Assoc., **111,** 21.
12 Jorpes, J. E. (1946): *Heparin in the Treatment of Thrombosis,* 2nd ed., pp. 170-171. London: Oxford University Press.
13. Hendry, W. G. (1948): Brit. Med. J., 24 January.
14. Sandblom, Ph., Ekstrom, G. and Quist, O. (1948): Acta Chir. Scand., **96,** 323.
15. Stats, D. and Neuhof, H. (1947): Amer. J. Med. Sci., **214, 121.**
16. Loewe, L., and Hirsch, E. (1947): J. Amer. Med. Assoc. **133,** 1263.

VERENIGINGSNUUS : ASSOCIATION NEWS

JOINT MEETING—1951
British Medical Association and the Medical Association of South Africa

The first circular in connection with the Joint Meeting of the British Medical Association and the Medical Association of South Africa, which will be held at the University of the Witwatersrand from 16-21 July 1951, has been issued. Any reader who has not received a circular should write to the General Secretary, Joint Meeting 1951, 5 Esselen Street, Johannesburg, for a further copy.

GESAMENTLIKE VERGADERING—1951
Britse Mediese Vereniging en die Mediese Vereniging van Suid-Afrika

Die eerste omsendbrief in verband met die Gesamentlike Vergadering van die Britse Mediese Vereniging en die Mediese Vereniging van Suid-Afrika, wat gehou sal word te die Universiteit van die Witwatersrand vanaf 16-21 Julie 1951, is reeds uitgereik. Enige leser wie nog nie 'n omsendbrief ontvang het nie, geliewe aan die Algemene Sekretaris, Gesamentlike Vergadering 1951, Esselenstraat 5, Johannesburg, te skryf vir 'n verdere afskrif.

PASSING EVENTS

The next meeting of the Federal Council of the Medical Association of South Africa will be held at Medical House, 5, Esselen Street, Johannesburg, from 12 to 14 October 1950. The Executive Committee and the Central Committee for Contract Practice will meet at the same place on 11 October.

Members of Council are advised to make the necessary hotel reservations at an early date.

* * * *

The Faculty of Radiologists, England, has unanimously decided to invite Prof. S. F. Oosthuizen to accept an Honorary Fellowship of the Faculty. This is the highest distinction which the Faculty can confer. The roll of Honorary Fellows is limited to 20 in number.

1947 EAST LONDON CONGRESS PHOTOGRAPH

There is still available a limited number of printer's art copies of the East London Congress photograph published as an art supplement to the *Journal* of 8 November 1947.

Members who wish to have copies of this supplement (*gratis*) should write to the Editor, P.O. Box 643, Cape Town, without delay.

M.B., CH.B., UNIVERSITY OF CAPE TOWN

The following candidates were successful in obtaining the degree of M.B., Ch.B., University of Cape Town, at the graduation ceremony on 30 June 1950:—

John Fletcher Alexander, Daniel Jack Anziska, B.Sc., Wessel Grotwahl Badenhorst, George Lennox Becker, Bruno Blanckenberg, Ewart Briggs, Robert Adam Findlay, Hyman Goldberg, Peter Graham-Parker, Lionel Norman Helfand, David Justin Mortimer Jenkin, Raymond André Joseph Leclézio, Richard Henry George Lindsay, Phillippus Augustus Luckhoff, B.Sc., Petro Henriette Malherbe, Anna Elizabeth Mentz, John Arthur William Miller-Cranko, Carel Gert Steenkamp Nel, Daniel O'Connell, Jacqueline Ospovat, Samuel Pikholz, Manuel Ralph Porter, Raymond Denley Potts, Guillaume Frederic Balthazar Ritchie-Fallon, Ivor Shattenstein, Johannes Jacobus Stephanes Strydom, Gysbert van Veijeren, Pauline Margaret Webb, B.Sc.

IN DIE VERBYGAAN

Dr. C. C. Pretorius en sy eggenote (dr. Tobie Muller) wat so pas van 'n uitgebreide studiereis van 16 maande in die buiteland teruggekeer het, sal tot die einde van die jaar in Kaapstad vertoef waar dr. Pretorius 'n aanstelling by die Mowbray-kraaminrigting gekry het. Daarna vertrek hulle weer na Pretoria om hulle permanent daar te vestig.

IN MEMORIAM

DR. G. A. BEYERS

On the morning of 21 June 1950 Dr. G. A. Beyers, beloved by everybody who knew him, passed away after a most painful illness, which he bore stoically and with unusual fortitude.

I do not intend to write about his success as a family doctor, district surgeon, a senior surgeon of the Kroonstad General Hospital or about his serving as a medical officer with the rank of Major in World War I; but I should like to say a few words about his charming personality and wonderful character.

To know this man with a heart of gold was to love him. He won universal affection through his friendly and kindly nature and through his desire always to help others. He was gentle in his ways, and consideration for others was one of his ruling principles; in short, he was a true gentleman.

In Kroonstad, where he practised for many years, he made a point of helping and promoting the interests of doctors who were struggling to establish a practice or who had recently arrived to set up practice there. This seems incredible and yet it is perfectly true. He promoted friendliness and good fellowship amongst his colleagues and held up by his example a high ethical and moral standard for us to follow.

Dr. Beyers led a very happy family life with his devoted wife and three daughters. He loved his home and when he was not busy, he was generally to be found there quietly enjoying himself with his family. A large number of friends and acquaintances visited him at his hospital to enjoy a friendly chat.

Dr. Beyers' chief recreation was farming and breeding some of the finest Afrikander cattle in South Africa. His cattle won many first class prizes on the Rand Show. He bred his herds and he loved the land.

In one's journey through life it is not often that one meets such a lovable and noble personality. Dr. Beyers has gone, but sweet memories of him will always remain to cheer, guide and inspire us through the years that lie ahead. He did his duty as a man and life is richer and better because he passed this way.

F. A. Lomax.

Kroonstad.
23 June 1950.

NEW PREPARATIONS AND APPLIANCES

GRAMODERM-SCHERING

Gramoderm is an antibiotic ointment for the control of gram-positive organisms. The effective ingredient of *Gramoderm* is Gramicidin, a pure antibiotic substance, the active principle of tyrothricin. Now available to the medical profession for the first time, Gramicidin is presented in stable form free from the tissue-irritating substances. As it is the active principle of tyrothricin, it is naturally more potent by weight than tyrothricin itself in the topical treatment of gram-positive infections.

Because of the relative insolubility of Gramicidin, its chemotherapeutic value has not been recognized heretofore. However, the discovery of an effective dispersing agent, which has been incorporated into Schering's *Gramoderm*, has now made Gramicidin very effective *in vivo* against gram-positive infections. It provides the physician with a new and more powerful approach to the topical treatment of these conditions.

Gramoderm is effective for the therapy of certain skin infections such as impetigo. It is of value in the prophylaxis of infection following superficial cuts, burns and abrasions. *Gramoderm* contains 0.25 mg. of Gramicidin in each gm. of Procutan, a new improved base developed for topical administration by Schering's Research Laboratories. This base has the advantages of greater ease of application, penetration and effectiveness. Furthermore, no allergic reactions to it have been reported.

Superficial cuts, abrasions and minor burns may be treated by washing the affected area with a mild soap and water followed by the application of *Gramoderm* once or twice daily.

For the treatment of infected eczematoid dermatitis, impetigo secondary to herpes, and other superficial skin conditions caused by susceptible organisms, *Gramoderm* may be applied two or three times daily. At night an occlusive dressing may be used if necessary.

For impetigo eczematodes, impetigo contagiosa, ecthyma and infected superficial wounds caused by susceptible organisms an occlusive dressing may be used. *Gramoderm* is spread on linen-like material and placed over the involved area. The area is then covered with absorbent cotton and the dressing held in place with a gauze bandage using no adhesive tape. The occlusive bandage may be renewed every twelve hours.

Gramoderm is available in 20 gm. tubes containing 0.25 mg. of Gramicidin per gm. of Procutan base.

Further information may be obtained from the distributors for Southern Africa: Scherag (Pty.), Limited, P.O. Box 7539, Johannesburg.

AMPTELIKE AANKONDIGING

Mediese Assistent-Sekretaris

Aansoeke deur tweetalige geneeshere word gevra vir die betrekking van Mediese Assistent-Sekretaris van die Mediese Vereniging van Suid-Afrika by sy Hoofkantoor in Kaapstad.

Die salarisskaal is £1,250 × 50—£1,500 plus lewenskostetoelae teen Regeringskaal (£208 per jaar vir getroude persone en £57 4s. vir ongetroudes).

Van die suksesvolle aansoeker sal verlang word dat hy by die Vereniging se pensioenskema aansluit.

Aansoeke moet gerig word aan die Mediese Sekretaris, Posbus 643, Kaapstad, en moet vergesel word van drie resente getuigskrifte. Sluitingsdatum vir die ontvangs van aansoeke 31 Augustus 1950.

OFFICIAL ANNOUNCEMENT

Assistant Medical Secretary

Applications are invited from bilingual medical practitioners for the post of Assistant Medical Secretary of the Medical Association of South Africa at its Head Office in Cape Town.

The salary scale is £1,250 × 50—£1,500 plus cost-of-living allowance at Government rates (£208 per annum for married persons and £57 4s. for single persons).

The successful applicant will be required to subscribe to the Association's Pension Scheme.

Applications should be addressed to the Medical Secretary, P.O. Box 643, Cape Town, and should be accompanied by three recent testimonials. Closing date for the receipt of applications 31 August 1950.

QUESTIONS ANSWERED

Emetic Treatment of Poisoning

Q. Is there any contraindication in using apomorphine as an emetic in a patient who has just recently swallowed poison and is not yet suffering from shock or is not in any way collapsed? If a stomach tube is not available, would one be justified in giving it to a child and in what dose?

A. The stomach tube is nowadays preferred to emetics in the treatment of poisoning. Apomorphine is satisfactory in arsenic, oxalic acid and wood alcohol poisoning; in narcotic poisoning it may not act, because of the depression of the vomiting centre. An overdose may cause severe depression and death (exceptionally) may occur if the patient was shocked, narcotized or deeply intoxicated. Textbooks on paediatrics do not seem to favour apomorphine, gastric lavage being preferred. Apomorphine hydrochloride by mouth, may be given in syrup to children in doses of 1/120th-1/30th gr., ½-2 mg. as a nauseant expectorant.

CORRESPONDENCE

Counter Prescribing

To the Editor: As a pharmacist I was interested in a letter which appeared in your *Journal* accusing pharmacists of prescribing and even diagnosing in conditions where they are ignorant. This is a serious charge.

My experience does not uphold this view as most counter prescribing does not amount to much more than a bottle of cough mixture or something for a headache. Most pharmacists have a working knowledge of the action and uses of the drugs they handle and know the prescribing of these is the province of the medical profession.

Probably there are some chemists who overstep the mark in prescribing in order to augment their livelihood which has been taken over by the dispensing doctor (but this does not justify them in so doing). Do not advertisements appear in your *Journal* selling 'dispensing practices'?

R. B. Maule, M.P.S. (G.B.).

12, Elizabeth Avenue,
Gwelo.
24 June 1950.

Screening of the Sinuses

To the Editor: I wish to reply to some of the remarks made by Drs. H. Hirschson and J. N. Jacobson in reply to my letter in the *Journal* of 17 June 1950. 'Clinician' has said nothing which merits any serious consideration.

The whole point of my letter was that a report describing the maxillary antra and frontal sinuses as normally transradiant on screen examination, could mislead the practitioner into believing that the sinuses were normal. At no stage did I deny that opacity of an antrum could be detected on the screen. I merely conveyed the fact, and this I now reiterate, that the absence of opacity does not entitle one to infer that pathology is not present. This view is entirely supported by the late E. W. Twining in *British Authors* (p. 100) as cited by both Drs. Hirschson and Jacobson. I have always been aware of this statement by Dr. Twining, but I would point out that he goes no further than to state that an opacity of the antrum can be seen on the screen. He does not say a sinus is normal, if an opacity is not seen on screening. This point, which is the crux of my letter, has apparently been missed completely by Drs. Hirschson and Jacobson. My statement that no hospital overseas takes upon itself the responsibility of ruling out sinus pathology on screen examination still holds good.

Dr. Hirschson makes the statement that the procedure in question might save the patient suffering and pain as well as expense. I submit, however, that the patient might be far more inconvenienced by the postponement of treatment for a diseased antrum which might well be present in spite of a negative report based on a screen examination.

There are two other points in Dr. Hirschson's letter which call for some comment: Firstly, I cannot see why he put the question whether I believe in the screening of a chest before a barium meal examination. Surely nobody could regard this procedure and the one at issue as analogous. Anyway, the answer is: Yes, I do believe in it! But let me stress that I would never presume to say that no intrathoracic pathology existed merely because I had not detected anything on the screen.

Secondly, I would point out to Dr. Hirschson that it was the late Dr. E. W. Twining who made the statement on page 100 of *British Authors* and not Dr. Peter Kerley, as he states in his letter. Dr. Hirschson has mentioned the esteem in which Dr. Kerley is held by the radiological world, and rightly so. May I add then that I was privileged to train under Dr. Kerley for two years at the Westminster Hospital, London, and that the views expressed by me in my letters are a direct reflection of his own practice and teachings.

Victor Berman.

African Life Buildings,
85, St. George's Street,
Cape Town.
9 July 1950.